Environmental Mamanegement Programme for Maseve Platinum Mine, as amended

DMR Ref Number: (NW) 30/5/1/2/3/2/1/528EM

Green Gold Ref No.: GGG18/09

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PREPARED BY:

Green Gold Group (Pty) Ltd

PREPARED FOR:

Royal Bafokeng Platinum

DOCUMENT CONTROL

Approved EMPR

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EMPR Amendment

	Mining Permit Holder	**Environmental Assessment Practitioner**
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Report Ref No.:		GGG18/09
Report Date:		2019 09 03

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1. INTRODUCTION

Maseve Mine in an underground platinum mine located about 6km south-west of Sun City and approximately 35km south-west of Rustenburg. The Department of Mineral Resources (DMR) awarded an environmental authorisation to operate the mine to Maseve Investments 11 (Pty) Ltd.) who was the owner of Maseve Mine at the time.

The current Environmental Management Programme (EMPR) was approved on 15 May 2012 (See Appendix 1) by DMR- North-West Regional Office. Royal Bafokeng Platinum acquired Maseve Mine on 19 April 2018, and therefore by extension, inherited the EMPR that is now being amended. Green Gold Group (Pty) Ltd has been appointed by Royal Bafokeng Platinum (the new owner of Maseve Platinum Mine) to amend the current approved EMPR. Below are the details of the proposed amendments.

1.1 Proposed changes

Proposed changes are outlined in Table 1. In addition to Table 1, the following changes are recommended and have been incorporated in this EMPR format for DMR approval:

- A cover page has been included to make this EMPR an independent document for ease of auditing (not continuation of EIAR as the previous version).
- Separate table of contents has been included.
- Page numbering will start from page 1 (the previous version started at page 393).
- Sections numbering to start from Section 1 (the previous version started at Section 13).
- Numbering of tables (tables in the previous section were not numbered)
- Figures numbering to start from Figure 1 (the previous version started at Figure 85)

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Table 1: PROPOSED AMENDMENT/S AND RELATED INFORMATION

Page number	Current EMPr wording	Proposed amendment to EMPr	Clear motivation for proposed amendment
Pg. 58	Name of Company: Maseve Investments 11 (Pty) Ltd Name of Project: WBJV Project 1 (Maseve) Physical Address: Technology House, Greenacres Office Park, Corner of Victory & Rustenburg Rd, Victory Park, Johannesburg, 2193. Postal Address: Postnet Suite No. 81, Private Bag X12, Rooseveltpark, 2129, South Africa. Company Registration No.: 2008/018995/07 Telephone: +27 11 782 2186 Fax: +27 11 782 4338 Platinum Group Metals Ltd is a company incorporated in Canada with registered offices in Vancouver and is also listed on the Toronto Stock Exchange **(PTM: TSK)** and in the New York Amex Stock Exchange **(PLG: NYSE-AMEX)**.	Name of Company: Royal Bafokeng Platinum Limited Name of Project: WBJV Project 1 (Maseve) Physical Address: The Pivot, No. 1 Montecasino Boulevard Block C, Floor 4, Fourways, 2021. Postal Address: P. O. Box 2283, Fourways, Johannesburg, South Africa, 2055. Company Registration No.: 2008/015696/06 Telephone: +27 (0) 10 590 4510 Fax: +27 (0) 86 210 9421	Change of ownership.
397 Operational Phase 3rd bullet	Stockpile Height and Slope Stability: Soil stockpile and berms heights will be restricted where possible 15m and <1.5m respectively so as to avoid compaction and damage to the soil seed pool. Stockpiles exceeding 1.5m should be benched at 2m intervals. The stockpile side slopes should be stabilized at	Stockpile Height and Slope Stability: Soil stockpile and berms heights will be restricted where possible to maximum height of 2m respectively so as to avoid compaction and damage to the soil seed pool. The stockpile side slopes should be stabilized at a slope of 1 in 6.	A 2m maximum stockpile height will minimise loss of soil through wind erosion.

	a slope of 1 in 6. This will promote vegetation growth and reduce run-off related to erosion.	This will promote vegetation growth and reduce run-off related to erosion.	
Pg. 399 Management Measures Construction Phase 1st bullet	Before the establishment of any of the proposed infrastructure, a plant rescue exercise should take place to remove any plants of medicinal value, especially: forbs. Indigenous plants and seeds should be harvested and held in nurseries to assist with the re-vegetation/ rehabilitation/ restoration of disturbed areas, gardens and tailing dams.	Before the establishment of any of the proposed infrastructure, a plant rescue exercise should take place to remove any plants of medicinal value, especially: forbs. Rehabilitated areas will be seeded with indigenous seeds to encourage growth of pre-mining indigenous plants.	There is no nursery nearby the operation, it would be impractical and costly to maintain the plants until mine closure.
Pg. 399 Management Measures Construction Phase 3rd bullet	The removed indigenous trees should be made available to the local communities to reduce the illegal harvesting of trees in the areas. Other organic litter (branches, leaves) should be used in the creation of compost.	Delete	There are no trees in the area.
Pg. 401 Management measures Operational phase 1st bullet	Driving at night prohibited, except for emergencies; a speed limit of no more than 40km/h must be enforced. Booms should be erected to restrict access to the haul and other roads at night. Speed humps should be placed on these roads to ensure that the speed limit adhered to.	When driving at night, a speed limit of no more than 40km/h must be enforced. Booms should be erected to restrict access to the haul and other roads at night. Speed humps should be placed on these roads to ensure that the speed limit adhered to.	Driving at night cannot be avoided. The mine operates 24-hours a day.
Pg. 404 Management measures	Ongoing testing of local borehole yields to determine impact on local users.	On-going borehole water level monitoring to be implemented to determine the impacts on local users.	Yield cannot be an indication of the mine's impact or lack thereof.

Construction phase 3rd bullet			
Pg. 406 Management measure Construction and operational phase 2nd bullet	Damp mechanical vibrations of equipment.	Delete	The management measure is ambiguous, it should be deleted.
Pg. 420 2nd sentence	It is recommended that this environmental performance and legal compliance audit be undertaken once a year.	It is recommended that this environmental performance and legal compliance audit be undertaken once every two years by an independent external auditor.	Environmental performance and legal compliance audits are undertaken once every two years in line with the MPRDA requirements.
	Internal audits must also be performed focusing on the following: • Environmental management plans • Emergency Action Plans; • Legal Compliance; and • Monitoring Plans	Delete	An external performance assessment will covers all the listed focus areas, we do not need both.
Pg. 421	During the rehabilitation exercising soil quality monitoring should be carried out to accurately determine the fertilizer requirements that will be needed. Additional soil sampling should also be carried out annually until the levels of nutrients, specifically: magnesium, phosphorus, and potassium, are at the required levels of nutrients for sustainable growth. Once the desired nutritional status has been achieved, it is recommended that the interval between sampling is increased.	Soil fertility should be assessed and reported on an annual basis after closure.	There is no need for soil monitoring during operation as the rehabilitation exercising will mainly occur after closure.

Pg. 423	1. Mammals: small mammal communities will be monitored using small mammal live traps for fixed sample periods biannually.	1. Mammals: small communities will be monitored using small mammal live traps for fixed sample periods biennially (2 years).	Changes in biodiversity are gradual, biannual monitoring will therefore not yield any positive results.
Pg. 427	It is recommended that (in addition to dustfall monitoring) ambient PM10 monitoring be conducted on: Sundown Ranch (MD1), Frischgewaagd (MD2) and Chaneng (MD3).	Dust fallout will be monitored monthly and PM 10 will be monitored only when the dust fallout concentrations consistently exceed the legal limits.	The current dust concentrations are within the legal limits.
Pg. 428	A blast report will be compiled after each blast with the aim to detect the ground vibrations.	Delete	Applicable to opencast mining and not underground mining.

2. ENVIRONMENTAL MANAGEMENT PROGRAMME

2.1 Topography

Topography	Management
Phase	• Construction • Operational • Decommissioning
Potential impact(s)	Alteration of the topography due to construction activities and mining operations. Residual impacts in terms of the TSF and the WRD's will remain.
Objectives/targets	*Construction Phase* • To minimise the disturbance of the topography as far as is possible. • To prevent the erosion of excavated areas and stockpiled soil by keeping free draining surface. • To minimise impacts on local drainage pattern. *Operational Phase* • To create a TSF with less steep slopes and angles so as to reduce the impact on the topography and by reducing erosion of TSF side slopes. *Decommissioning Phase* • To ensure that all rehabilitated surfaces are profiled correctly to allow free drainage of surface water, without causing erosion
Management measures	*Planning and Design Phase* • Harsh, steep engineered slopes (as normally designed) should be avoided for the TSF and WRD's (if at all possible) as these would impose an additional impact on the landscape by contrasting with existing topographic forms. The TSF and WRD's are the only features that will remain after decommissioning, it is important that a long-term view of its integration with surrounding landscapes be taken into account. *Construction Phase* • Construction should be limited to: -footprint areas; -areas as depicted on the block plan; -areas away from koppies or naturally elevated areas; -outside of the sensitive drainage lines; and -outside 1:100-year floodline areas and riparian zones. • Construction activities should include ongoing rehabilitation, especially soil management. Soil mismanagement can lead to erosion which can have a significant impact on the local topography over the long term. *Operational Phase* • Appropriate stormwater management structures should be installed as not to impact on soil conditions which could impose impacts associated with sediment run-off and erosion. • Topsoil cleared for the establishment of the TSF should be utilised for continuous rehabilitation. Soil should be placed on the slopes and vegetation should be established. The monitoring of vegetation is of utmost importance and unsuccessful attempts should be attended to. *Decommissioning Phase* • Profiling of the landscape will take place to ensure the area is rehabilitated as close to its natural state as possible. • The portals will be backfilled with a significant portion of water rock. It will be the intent to utilise as much of waste rock as possible to backfill declines and the portal structures. Once backfilled the area will be sloped according to its natural gradient and slope to allow for the surface water run-off.

	• Drainage lines and storm water management structure will be removed in order to allow for the free drainage of water over the area.
Responsibility	• The construction manager, or the mine manager in conjunction with the environmental officer/appointee, is responsible for these management objectives. • The engineer/company appointed to oversee the operation of the TSF will be responsible for ensuring its safe construction according to design, and in conjunction with the environmental officer/appointee is responsible for the ongoing rehabilitation through to closure.
Timeframes	As per the construction, operational and decommissioning phases outlined above.

2.2 Geology

Geology	**Management**
Phase	• Construction. • Operational. • Decommissioning
Potential impact(s)	Disturbance of the natural geology and the disturbance of a non-renewable mineral resource. Positive impact the terms utilisation of this resource to: generate income, stimulate local, regional economies, and contribute towards the national GDP.
Objectives/targets	*Construction Phase* • To ensure the optimal location and construction of portals and declines for mining *Operational Phase* • To create as little as possible disturbance in terms of the geology that could result in surface and subsurface disturbances. *Decommissioning Phase* • To ensure that underground declines, tunnels and structures are left stable as to prevent surface subsidence.
Management measures	*Planning and Design Phase* • Feasibility designs should be conducted on a confidence level that will allow for the optimal placement of portals and declines to access reef. Mine design should focus on all reefs with a mining potential. *Construction Phase* • The reefs should be mined and processed to ensure affective extraction of ore. • The start of portal construction and decline development will be done in line with OHSA and MHSA as well as other best practise methods to ensure that underground conditions are safe. Measures should also be implemented to prevent the possible collapse of underground workings. *Operational Phase* • The plant should be designed for optimal extraction of the target minerals from the ROM ore using current best practices and technology. *Decommissioning Phase* • Underground working should be left safe and all mining areas should be sealed off where applicable and appropriate.
Responsibility	The construction and/or mine manager.
Timeframes	As per construction, operational, and decommissioning phases outlined above.

2.3 Soils, Land Use and Land Capability

Soils, Land Use and Land Capability	**Management**
Phase	• Construction. • Operational.

	• Decommissioning
Potential impact(s)	Damage of soil integrity, losses due to erosion, pollution with the indirect impact of the loss of the loss or destruction of the soil land use potential closure.
Objectives/targets	*Construction Phase* • To ensure that soil integrity is maintained with minimal soil losses during soil stripping and storage. Correct placement and long-term storage strategy employed. *Operational Phase* • To ensure that soil is tested regularly in terms of fertility and that a fertilising programme is followed if needed. *Decommissioning Phase* • Successful placement of topsoil and erosion control.
Management measures	*Planning and Design Phase* • Feasibility designs should be conducted on a confidence level that will allow for the optimal placement of portals and declines to access reef. Mine design should focus on all reefs with a mining potential. *Construction Phase* • Delineation of areas to be stripped: - Stripping will only occur where soils are to disturbed by activities that are described in this report and where a clearly defined end rehabilitation use for the stripped soil has been identified • Reference to biodiversity action plan: - It is recommended that all vegetation is stripped and stored as part of the utilisable soil. • Stripping and handling of soil: o Wherever possible, soils will be handled in dry weather conditions so as to cause as little compaction as possible. o Topsoil and the portion of subsoil (B2/1) must be removed and stockpiled separately from the lower "B" horizon, with the sub base materials being separated from the soft/composed rock, and wet or highly structures soils separated from the dry more friable sandy loam and sandy clay loam soils if they are to be impacted. o The "utilizable" soil will be stripped to a depth of 500mm or until hard rock is encountered. These soils will be stockpiled together with any vegetation cover present. o Total stripping depth should be 750mm wherever possible • Delineation of stockpiling areas: o Stockpiling areas will be identified in close proximity to the source of the soil in order to limit handing and to promote the reuse of soils in the correct areas o All stockpiles will be founded on well-engineered and free draining stockpile pads. o Soils stockpiles will be demarcated and clearly marked to identify both the soil type and intended area of rehabilitation. *Operational Phase* • Stockpile management:

	○ Vegetation establishment and erosion control: Enhanced growth of vegetation on the soil stockpiles and berms will be promoted (e.g. by means of watering and /or fertilisation), or a system of rock cladding will be employed. The purpose of this exercise will be to protect the soils and to combat erosion by water wind. ○ Strom water control: stockpiles will be established/engineered with storm water diversion berms put in place to prevent run off erosion. ○ Stockpile Height and Slope Stability: Soil stockpile and berms heights will be restricted where possible to maximum height of 2m to avoid compaction and damage to the soil seed pool. The stockpile side slopes should be stabilized at a slope of 1 in 6. This will promote vegetation growth and reduce run-off related to erosion. ○ Waste: Only inert waste rock material will be placed on the soil stockpiles if the vegetative growth is impractical or not viable. This will protect the stockpile from stockpile. ○ Vehicles: Equipment, human and animal movement on the soil stockpile will be limited in order to avoid compaction and subsequent damage to the soils and seed bank. <u>*Decommissioning Phase*</u> • Rehabilitation of disturbed land restoration of soil utilisation: ○ Placement of Soils: Stockpile soils will be used to rehabilitate disturbed sites. The utilised soils removed during the construction phase, must be redistributed in a manner that achieves an approximate uniform stable thickness consistent with the approved past development end land use (conservation capability and/or low intensity wildlife grazing) and will attain a free draining surface profile ○ Fertilisation: A representative sampling of the stripped and stockpiled soils will be analysed to determine the nutrient status and chemistry of the utilisable materials. As a minimum the following elements should be tested for: EC, CEC, pH, Ca, Mg, K, Na, P, Zn, Clay%, and organic Carbon. These elements provide the basis for determining the fertility of soil. Based on the analysis, fertilisers will be applied if necessary. ○ Erosion Control: Erosion control measures will be implemented to ensure that the soil is not wasted away and that erosion gullies do not develop prior to vegetation establishment. • Pollution of soil: ○ In-situ Remediation: If soil is polluted the first management priority is to treat the pollution by means of in situ bioremediation. The acceptability of this option must be verified by an appropriate soils expert and by the local water authority on a case by case basis, before it is implemented. ○ Off-site disposal of soils: if in-situ treatment is not possible or acceptable then the polluted soil must be classified according to the Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste additionally should be disposed of at a licence waste disposal facility.
Responsibility	The construction and/or mine manager.
Timeframes	As per construction, operational, and decommissioning phases outlined above

2.4 Flora

Flora	**Management**
Phase	• Construction. • Operational.

	• Decommissioning
Potential impact(s)	Introduction of alien species and the loss of biodiversity. Loss of endangered/threatened species is also possible impact.
Objectives/targets	*Construction Phase* • To restrict the development to dedicated footprint areas only and to preserve: medicinal, endangered, and species of conservation significance. • To prevent the introduction and/or spread of alien vegetation. *Operational Phase* • To prevent further impacts on the vegetation with the aim of improving the biodiversity of the area. • Not to impact on sensitive areas or ecosystems. • Not to impact on any area not intended for mining developments. • Not to constrict the flow of surface water to sensitive areas and riparian zones. • To prevent the spread of alien vegetation. *Decommissioning Phase* • To restore the biodiversity of the area. • To prevent the spread of alien vegetation.
Management measures	*Construction Phase* • Before the establishment of any of the proposed infrastructure, a plant rescue exercise should take place to remove any plants of medicinal value, especially: forbs. • Rehabilitated areas will be seeded with indigenous seeds to encourage growth of pre-mining indigenous plants. • Any alien species encountered should be removed and treated according to the guidelines of the Conservation of Agricultural Resources Act. • Runoff from the construction sites should be monitored and controlled in order to prevent erosion of areas adjacent to the construction areas. *Operational Phase* • Environmental management during this phase is mainly concerned with the proactive monitoring and control of alien vegetation. Storm runoff should be monitored to prevent erosion. • Only regional indigenous vegetation should be used in the re-vegetation of the tailing dam at assist with the dust control. • Compost from the organic litter obtained during the construction phase should be used for improving the soil fertility on the dams. The introduction of earthworm compost could also be considered. *Decommissioning Phase* • Areas where infrastructure has been removed need to be re-vegetated using regional indigenous species from the area. • The area should be monitored for alien infestation for at least a 3-year period from decommissioning and closure.
Responsibility	The construction and/or mine manager.
Timeframes	As per construction, operational, and decommissioning phases outlined above

2.5 Fauna

	Management
Phase	• Construction. • Operational. • Decommissioning
Potential impact(s)	• The loss and degradation of untransformed faunal habitat.

	• The loss of bird life as a result of electrocution and collision resulting from the presence of power lines related to the project. • The loss of animal life on newly constructed access roads due to collisions with vehicles, as well as diversion of waterways and disruption of wetland system flow. • The disruption of ecological connectivity and migration routes of larger, flightless animals as well as territorial infringement. • An increase in poaching. Snaring and trapping of wild animals. • The attraction of faunal species to the surface water present in the mining area as a result of the mining operation. • The impact associated with the potential leaching of chemicals into the groundwater and surface water in the region of the study area.
Objectives/targets	• To prevent the loss of biodiversity • To ensure as little as possible habitat destruction and no habitat destruction within sensitive areas. • To avoid contamination of surface and groundwater, this could impact on fauna habitat and health. • To ensure the overall protection of fauna.
Management measures	*Construction Phase* • The destruction of highly sensitive faunal habitat (outcrops and wetlands) should be avoided at all costs. • Clear and definite boundaries should be set in place for all of the actions associated with the project. • Fences must be erected where-ever possible. Construction operators as well as operational personnel should be instructed as to the physical boundaries pertaining to their respective disciplines and measures should be set in place to ensure that they keep to these boundaries (fines etc.). Natural environmental next to these areas must not be affected. • Erosion control measures must be put in place from the beginning of construction (wind break, water diversions, gabions etc) to ensure that artificial erosion associated with the activities of the project (construction, operation and decommissioning) do not degrade the natural ecological state of habitat bordering the various areas of activity. • To avoid collisions (mostly with the earth wire) the Eskom "bird flappers" should be installed on the earth wire of the power line – the same principle applies – the power line must be monitored to assess the severity of potential collisions once operational. • The construction of all roads should allow for the free movement of water (especially in low-lying areas) by means of large pipes under the roads (such pipes will also double as migration routes for smaller species cautious to cross the roads otherwise). • It should be ensured that the construction of the roads allow run-off water to join natural wetlands at speeds and volumes matching the natural bordering wetland systems (i.e. seepage wetlands compared to channelled fast-flowing streams). • Where-ever linear structures bisect natural areas of untransformed faunal habitat measures should be put in place to ensure continued movement of all faunal groups needing to cross such lines. • After the laying of underground pipelines for water and slurry, rehabilitation must be done swiftly and affectively. *Operational Phase* • When driving at night a speed limit of no more than 40km/h must be enforced. Booms should be erected to restrict access to the haul and other roads at night. Speed humps should be placed on these roads to ensure that the speed limit adhered to.

	• Regular inspection of these fences to ensure the fences' integrity, the borders and surrounding areas next to the mining area should be patrolled for the presence of snares etc. this will limit the impact of poaching and snaring. • There must be communication with farmers whose farm border the operational areas in order to create awareness of potential poaching problems in the area. • Areas of open water must be limited and covered as far as is possible. • Medium and large-sized mammals should be denied access to these open water areas by means of electrical fencing. • The development of steep slopes with fine, silty soils should be avoided to protect birds from getting stuck and drowning. • It should be ensured that leaching or spillage of any chemical into any natural water system (groundwater or surface water) occurs. • To prevent further impacts on the vegetation with the aim to improve the biodiversity of the area. *Decommissioning Phase* • To ensure the area is pollutant free (especially surface and groundwater) prior to the removal of fences.
Responsibility	The construction and/or mine manager.
Timeframes	As per construction, operational, and decommissioning phases outlined above

2.6 Surface Water

Surface Water	**Management**
Phase	• Construction. • Operational. • Decommissioning
Potential impact(s)	Introduction of alien species and the loss of biodiversity. Loss of endangered/threatened species is also possible impact.
Objectives/targets	*Construction Phase* • To separate dirty and clean water. • To contain dirty water in a system. • To prevent contamination of clear water. • To return clean water to the catchment. *Operational Phase* • To restore the biodiversity of the area. • To prevent the spread of alien vegetation.
Management measures	*Construction Phase* • Contamination of lean water: o Cover trucks o Create temporary berms and storm water management channels to contain dirty water. o Design and construct slopes to minimise erosion and possible increase of sediment in local water bodies and streams. • Stream flow: o Restrict construction to planned areas. o Develop storm water management plan to allow for the maximum run-off of clean water. o Restrict/reduce the footprint areas of dirty working areas. o Spills should be cleaned up immediately and reported to the environmental officer. Major spills should be reported to the Department of Water Affairs. *Operational Phase*

	• Control sediment run-off resulting from waste rock handling, conveying of waste rock, ore and tailings management and disposal. • Prevent chemical spills as far possible. Clean-up of the spills will be conducted immediately. • Major spills will be reported to Department of Water Affairs. • Maintain SWM system to ensure zero blockages or overflows. • Zero contaminations of clean water in clean water environments. • General protection of surface water as a valuable resource. • Monitoring of surface water quality on the mine and in close proximity to the mine. *Decommissioning Phase* • Ensure that TSF and waste rock dumps slopes are stable. • Ensure that SWM system is demolished appropriately to allow for free and natural draining of rainwater/ surface water to water bodies and streams. • Continue with water monitoring for at least 3-5 years after closure. • Control erosion to limit sediment.
Responsibility	The construction and/or mine manager.
Timeframes	As per construction, operational, and decommissioning phases outlined above

2.7 Groundwater

	Management
Phase	• Construction. • Operational. • Decommissioning
Potential impact(s)	• Impact on groundwater due to decline development • Impact on groundwater due to construction of dams. • Influx of groundwater into mine workings. • Deterioration in groundwater quality in the mining section and seepage into the receiving environment. • Inner-mine flow during the operational phase. • Groundwater quality impacts due to the TSF.
Objectives/targets	*Construction Phase and Operational Phase* • To prevent groundwater impacts as far as possible with appropriate mitigation measures. • To treat chemical spills immediately as to prevent surface and groundwater contamination. • Construct the TSF as to prevent groundwater contamination. *Decommissioning Phase* • To restore the areas as such as to prevent long term residual impacts.
Management measures	*Construction Phase* • Pump water to dirty water dams (if required) • Report spills and/or major impacts on groundwater to Department of Water Affairs • On-going borehole water level monitoring to be implemented to determine the impacts on local users. • Sampling and analysis of local borehole to determine possible contamination as early as possible. *Operational Phase* • Pump excess groundwater in mine workings to setting ponds. • Monitor boreholes for loss and quality changes. • Handle excess groundwater as part of the operational phase water balance. • The TSF and water management structures designed to prevent pollution into the environment.

	Decommissioning Phase • Cap and rehabilitate the TSF and other features. • Continuation of water sampling for a period of 3 to 5 years after mining.
Responsibility	The construction and/or mine manager.
Timeframes	As per construction, operational, and decommissioning phases outlined above

2.8 Air Quality

	Management
Phase	• Construction. • Operational. • Decommissioning
Potential impact(s)	• Impact on surface water, human health, fauna, and flora as a result of increased dust. • Increase in PM 10 (fugitive dues) in terms of ambient air quality.
Objectives/targets	*Construction Phase and Operational Phase* • To limit dust during all site activities. *Decommissioning Phase* • To ensure that the site is left stable in terms of the TSF and WRD's as to prevent windblown dust from these structures. • Areas are well vegetated to limit dust.
Management measures	*Construction Phase* • Effective dust suppression especially during the windy months. • Clearing of areas during non-windy months where possible. • Clearing of footprint areas only. • Establishing of appropriate fire breaks around the construction site. • No fuel or biomass burning. *Operational Phase* • Ongoing dust suppression. • Continuous rehabilitation of TSF to allow for minimal dust. • Effective shaping of TSF and vegetation establishment. • To minimise dust by means of water sprays as all ore transfer points. *Decommissioning Phase* • Ensure that TSF and WRD's are left stable. • Effective rehabilitation of TSF to minimise dust. • WRD's sloped and where possible vegetated.
Responsibility	The construction and/or mine manager.
Timeframes	As per construction, operational, and decommissioning phases outlined above

2.9 Noise

	Management
Phase	• Construction. • Operational. • Decommissioning
Potential impact(s)	Noise impacts as a result of blasting and site activities
Objectives/targets	*Construction and Operational Phase* • Limit noise to operational areas only • Establishment of an affective grievance mechanism to inform local residents of blasting and/or noise generation activities.

	Decommissioning Phase • To limit noise generation to areas to be demolished.
Management measures	*Construction and Operational Phase* • Fit efficient silencers and enclose engine compartments. • Maintain equipment conscientiously. • Erect berm, screen, or barrier at truck holding sited and any haul roads. • Carefully select permanent equipment positions. • Preferential choice of low noise plant • Reduce noise at source by acoustic treatment, etc. • Isolate source by acoustic enclosure, etc. • Standardised noise measurements should be carried out in individual equipment at the site to construct a reference database. • To do environmental noise monitoring. *Decommissioning Phase* • Decommissioning activities should be done inside the plant area prior to the removal of steel claddings • Surface rehabilitation with earth moving equipment should focus on the area to be rehabilitated; however, this impact will be similar as for construction where expected noise levels will be up to 5dB above the recommended values for a suburban area and within the recommended daytime noise levels of 50dB.
Responsibility	The construction and/or mine manager.
Timeframes	As per construction, operational, and decommissioning phases outlined above

2.10 Sites of Archaeological Interest

	Management
Phase	• Construction. • Operational.
Potential impact(s)	Destruction of below surface archaeological findings.
Objectives/targets	• To prevent all archaeological and historical site
Management measures	No archaeological sites have been found on the development footprint area. Should historical or archaeological sites be found during the course of construction or operations qualified archaeologist should be notified immediately.
Responsibility	The construction and/or mine manager.
Timeframes	As soon as these sites are discovered

2.11 Visual

	Management
Phase	• Construction. • Operational. • Decommissioning
Potential impact(s)	Changing the visual character of the area
Objectives/targets	*Construction and Operational Phase* • Measures should be feasible, effective and acceptable. • All mitigations should be designed to suit the existing landscape character and needs of the locality. • Mitigation measures should respect and build upon landscape distinctiveness.
Management measures	*Construction Phase and Operational Phase* • Project area development:

	○ As little vegetation as possible be removed from the construction site. ○ Dust suppression techniques should be in place at all times during construction. ○ Only the footprint and a small construction buffer zone should be exposed. As much possible natural vegetation should be retained. ○ Paint buildings and structure with colours that reflect and complement the natural colour of the surrounding landscape. Avoid pure whites and pure blacks. • TSF: ○ Harsh, steep engineered slopes (as normally designed) should be avoided if at all possible as these would impose an additional impact on the landscape by contrasting with existing topographic forms. The tailings dam is the only feature that will remain after decommissioning and it is important that a long-term view of its integration with surrounding landscapes be taken into account. *Decommissioning Phase* • Where the natural vegetation intrudes onto the sites it should be retained. • An ecological approach to landscaping is recommended. Plants introduced into the project, should be guided by ecological rather than horticultural principles. For example, ecological communities of indigenous plants provide more bio-diversity and habitat opportunities and would blend with the natural vegetation. This approach is also less costly to maintain and is sustainable in the long term once the plants have established. • Plant a combination of tall indigenous trees and shrubs within the development to absorb the views of the plant, vent shafts, incline shaft entrance, and the electricity generation area. • Plant large indigenous trees along the north, west east and southern boundaries of the site and along the exposed edges of the villages of Mafenya, Ledig, Chaneng, Robega, and Rasimone, to partially screen views of the development from the villages and the R565 road. • Only indigenous trees to the area should be used for rehabilitation/landscaping purposes during the closure phase.
Responsibility	The construction and/or mine manager.
Timeframes	As per construction, operational, and decommissioning phases outlined above

2.12 Traffic

	Management
Phase	• Construction. • Operational. • Decommissioning
Potential impact(s)	Increase in traffic on R565 due to: construction, operation, and decommissioning.
Objectives/targets	*Construction and Operational Phase* • To limit traffic impacts relating to traffic volumes, health, and safety.
Management measures	*Construction, Operational and Decommissioning Phases* • Design and construct a site entrance of the R565 that is safe and poses no threat to existing road users. • Allow for appropriate traffic calming measures during road construction. • If possible, limit the delivery of construction materials to after hours or during the day (avoid peak hour traffic times). • Deliver platinum concentrate to smelters during the day and after peak time traffic flow periods. • Allow for contributions toward road upgrades and maintenance (specifically R565).
Responsibility	The construction and/or mine manager.

Timeframes	As per construction, operational, and decommissioning phases outlined above

2.13 Socio-Economic

	Management
Phase	• Construction. • Operational. • Decommissioning
Potential impact(s)	Impacts associated with the influx of seekers, economic development, skills inequities, living conditions, health and safety, land acquisition etc. (as discussed in impact section).
Objectives/targets	• Maximise employment opportunities and limit skills inequities. • Minimise any potential negative impacts associated with the inflow of workers and jobseekers. • Provision of adequate accommodation for members of the construction team. • Maximise local economic contribution to ensure positive economic spin-offs for the communities. • Limit any possible negative impacts on the local tourism industry and enhance possible positive impacts. • Limit any possible dust pollution and unauthorised movement of construction workers on private properties; additionally, limit vehicle movement and increase in crimes levels. • Limit environmental pollution and social intrusions to avoid impacts on the daily living and movement patterns of neighbouring property owners and local community members. • Proper communication to the local communities regarding blasting activities, possible impact on structures, and possible compensation. • Limit any safety and security risks during the construction phase. • Avoid any additional pressure on infrastructure and services are a result of the proposed mine and mining activities. • Assist in combating the spread of sexually transmitted diseases and any negative impacts on the general health of the communities. • Rezoning of land for mining purposes to ensure local economic spin-offs. • Limit negative impact on the sense of place.
Management measures	*Construction, Operational and Decommissioning Phases* Maximise Employment Opportunities • Training of potential future employees, contract workers and/or community members should focus on mining related skills such as: rock drilling, welding, fitting, rigging, boiler making and so forth. • Training of local construction workers during the construction phase to enable them to be employable during the operational phase would not stop the flux of outsiders, but could attempt to minimise the number of "new" outsiders coming to the area in search of employment. • Training courses should be accredited and certificates obtained should be acceptable by other related industries. • The development of a mining institute funded by all the mines operating in the area is seen, from a community perspective, as a key mitigation measure in addressing the skills inequities in the local area. Such an option is achievable, although not necessarily economically feasible from a mining management perspective. • Existing lists of jobseekers could be obtained via community representative organisations and the local councillors within: Mafenya, Rasimone, Chaneng, Robega, Leding, and Phatsima. Local youth organisations could play an important

	role in this regard as they been involved in setting up databases for existing mines and mines being constructed. • Possible steps to be taken with regards to retrenchments should be clearly communicated to all employees, the relevant leaderships in the core communities and the RLM, as well as the MKLM. • Inflow of Temporary Workers and Jobseekers. • Construction workers falling within the semi-skilled to unskilled category should be sourced from the local population, where possible, to avoid possible conflict arising between local and the outside workforce, but also to limit the need for a temporary accommodation facility. • Introduce contractual obligations for contractors to use local labour as far as possible. • Contractors are to ensure that foreign workers reside in suitable facilities and not establish informal houses. • Construction workers should be supervised at all times. • Construction activities should be kept to normal working hours e.g. from 7am until 5pm during weekdays (daylight hours). • Property owners surrounding the construction areas should be informed of the construction schedules and activities. • Security on-site should be active prior to the construction period. • The construction site and accommodation facility should be properly managed to avoid any littering and possible environmental pollution. Water and sanitation facilities should be up to standard. • Information distributed as part of the existing HIV/Aids awareness campaigns undertaken in the area should again be focused on and communicated to the local workers. • Unrealistic employment expectations should not be created. • The development of informal vending "stations" where food and small goods are sold should be properly managed, to avoid: littering, safety risks, and possible environmental pollution. • Maximise the use of local labour and contractors where possible by developing a strategy that will involve local labour in the construction process. • The development, publication and widespread dissemination of a recruitment policy could serve, to encourage local employment and could reduce the potential influx of jobseekers to the area. • A representative of the WBJV project 1 (Maseve) could liaise with the traditional leaders and local councillors for the purpose of arranging key community meetings within the various wards. In order to discuss the employment and recruitment process; or to ensure that the correct information regarding this issue is portrayed to the communities. • Accommodation of Workforce. • For construction, should a temporary accommodation facility be required on site, this facility must be managed in an environmentally and socially acceptable manner to avoid any social conflict and environmental pollution. • Local accommodation facilities in close proximity to the site (e.g. radius of 10km) should receive preferences. • Once all local accommodation facilities have been exhausted other facilities further than the 10km radius from the proposed site should be considered. • Employees should be educated with regards to their accommodation options. • Housing needs should be monitored and addressed in consultation and cooperation with the RLM and MKLM, as well as the RBH. • The employment of locals should be maximised to limit the need for any additional housing infrastructure (as far as possible)

	<u>Local Economic Contribution</u> • Maseve should develop a database of local companies, including credible SMMEs that could qualify as potential services providers prior to the initiation of the project, the tender process. In this regard Maseve should liaise with local stakeholders, as well as with representatives of the RLM and MKLM. • Even if local companies and SMMEs would be considered during the construction phase of the project, the tender process should be based on competitive business principles and the quality of services to be rendered in order to ensure the adherence to standards and to maximise overall welfare. • SMMEs should be assisted with regards to: general business principles, financial management, management of stocks, competitive costing (pricing), and the marketing of their business. • Should SMMEs be appointed for the procurement of goods for the provision of services, the contract executions should be strictly monitored on a monthly basis. • From a community perspective, enterprise development is a key mitigation measure in this regard. The proponent should assist small businesses and/or SMME's to develop to a certain level where they can become involved in the tender process. Such measures, recommended by community representatives, could include the following: o The establishment of joint ventures between small businesses and established companies with relevant experiences within the tender process. o Some tenders for "less significant construction related activities" lower than a pre-agreed amount should be awarded to locals provided that these would have some form of experience and credibility to ensure that the quality of work is not compromised. o Payment systems should be flexible, but strictly controlled, to assist smaller businesses in terms of expenditure. o An audit of existing local enterprises that could provide services, goods, and material should be undertaken with the assistance of local leaders and community representatives, as well as local business structures. o SMME's should submit their business profile once the tender process starts to enable them to receive tender related documentation. • The mine should adopt a Procurement Plan whereby they aim to provide Historically Disadvantaged South Africans (HDSAs) and SMME's with the opportunity to become involved in the procurement of capital goods, consumables, and services. This plan should be implemented in conjunction with the local municipalities and local development programmes in the local municipalities. These programmes could focus on providing support and technical advice to entrepreneurs and/or SMMEs to enable them to supply goods and materials for operations at the future mine. • Local procurement of goods and service within the local communities is possible (such as the procurement of vegetables cultivated by the Machorora Organic Project and the Association for the Blind in Chaneng for use by the canteen). Local service providers can be sourced for e.g. brick making, steelworks, panel beating, mechanics, and so forth. <u>Local Tourism Industry</u> • Mitigation measures as proposed by the Visual Impact Assessment, Noise Impact Assessment, and Air Quality Assessment should be implemented to limit any possible negative impacts on the tourism industry.

	• The local tourism sector should receive preference should accommodation facilities be required. Farming Activities • Effective management of the mining activities to avoid any environmental pollution focusing on: water, waste and sanitation infrastructure and services; and limiting any increase in noise levels. • Strict security measures should be put in place. Security personnel should be on site on a permanent basis. • The mining area should be fenced to avoid entry of animals into the mining area. • The contractor should communicate the construction schedule and vehicle movements to the neighbouring property owners. Daily Living and Movement Patterns • Dust suppression methods (as recommended in the Air Quality Impact Assessment) should be strictly implemented if and where required. • Should local road users be affected by the movement of the construction vehicles or by the construction activities taking place across roads, sufficient warning signs should be erected. • All construction vehicles should be in a good condition and should adhere to road worthy standards. • Dust creation should be kept to a minimum by adhering to the speed limits on the gravel roads. • The construction of additional access roads should be limited. • Speeding of construction vehicles must be strictly monitored. • Mine related traffic (especially heavy vehicles) should aim to avoid the morning and afternoon traffic peaks and should avoid the times when children are walking to and from school. • Due to the high traffic volumes on the R565 it is imperative that the entrance to the mine should be designed in consultation with the Department of Works, Roads and Transport. Traffic calming measures around this section of the road could also be introduced. Blasting • The existing communication process undertaken through e-mails and pamphlets distributed to the communities via the traditional leaders to communicate the blasting activities undertaken during the bulk sampling process should continue during the construction phase. • Representatives of Maseve should communicate the findings of the Blasting and Vibration Study to the possibly affected communities such as: Mafenya, Rasimone, Robega, and Chaneng. • Blasting activities should be restricted to non-intrusive times (e.g. blasting on Sundays and during the night should be avoided). • The impact of blasting on nearby properties (dwellings) should be monitored frequently. • Cattle farmers should be notified timeously of blasting schedules (to allow them sufficient time to move their animals). • A communication channel should be established through the traditional leaders and their community meetings to ensure that community members are aware of the procedures and communication process to be followed when possible blasting impacts would like to be reported. A community liaison officer could be appointed to assist community members in this regard. • Property owners whose dwellings have been negatively affected should be compensated by the responsible mining company once it has been determined that such structures have been negatively affected by blasting activities related to mining. Safety and Security

	• A Fire/Emergency Management Plan should be developed and implemented. It is important that this management plan and associated communication channels are developed at the outset of the construction phase. It would be important to regularly review the functionality and efficiency of such a plan in conjunction with the local emergency teams, mine management and affected communities as well as neighbouring landowners. • Open fires for cooking and related purposes should not be allowed on site. • Appropriate firefighting equipment should be on site and construction workers should be appropriately trained for firefighting. • The project proponent and contractors should discuss the safety and security issues, as well as construction schedules with the local community leaders and the local police service. • The construction area should be fenced or access to the area should be controlled to avoid animals from entering, or people entering the area without authorisation. • The construction sites should be clearly marked; "danger" and "no entry" signs should be erected. • Speeding of construction vehicles must be strictly monitored. • Mine related traffic (especially heavy vehicles) should aim to avoid the morning and afternoon traffic peaks and should avoid the times when children are walking to and from school. • Due to the high traffic volumes on the R565 it is imperative that the entrance to the mine should be designed in consultation with the Department of Works, Roads and Transport. Traffic calming measures around this section of the road could also be introduced. • Maximise the employment of locals where possible. <u>Health Impacts</u> • Maximise the employment of locals where possible. • An on-site clinic should be established as a priority. • First aid supplies should be available at various points at the construction site. • The general health services should be notified of the construction schedule and peak construction periods. • Continue and extend the current HIV/AIDS awareness and support programmes, with specific focus on those in and nearby the construction site. • The general health of construction workers should be monitored on an ongoing basis. • Concerning health issues, PTM should closely liaise with the representatives of the Moses Kotane Hospital to jointly develop solutions to some of the community issues and to determine which role PTM could play in this regard. • PTM should consider assisting with the improvement of the ambulance services and community health infrastructure. Their involvement in this regard should be discussed with the Provincial Department of Health, of the Moses Kotane Hospital, community health care workers in the study area, traditional leaders and councillors. <u>Infrastructure and Services</u> • Maximise the employment of locals where possible. • Maintenance of the roads frequently used by construction traffic e.g. R565 should be discussed and negotiated with the Department of Public works, Roads and Transport. • PTM should consider assisting local municipalities and service providers with basic service provision in the area. • PTM should consider providing focused assistance to health infrastructure as part of their CSI project.

	• Community members indicated that PTM (Maseve) could assist with the hiring of additional nurses for the Chaneng Clinic, and in future, assist with the upgrading and extension of the clinic. • PTM should consider providing assistance in terms of the capital expenditure associated with the upgrade of the electricity supply grid of the area. • PTM should consider providing assistance, in terms of the capital expenditure associated with establishing the new Pilanesberg South Water Supply Pipelines. <u>Land Acquisition and Zoning</u> • Skills development, social developmental support and local economic contribution should be implemented to enhance the positive impacts to the communities in this regard. <u>Visual and Sense of Place</u> • The construction site should be kept litter free. • Site rehabilitation on certain sections of the site should occur as soon as the construction process allows. • The recommendations made by the Visual Impact Assessment should be adhered to. <u>Noise</u> • The mitigation measures of the Noise Impact Assessment should be implemented. • Construction vehicle should be in good working order. • Construction activities should be kept to normal working hours e.g. 7 am until 5 pm during weekdays. • The existing communication process undertaken through e-mails and pamphlets distributed to the communities via the traditional leaders to communicate the blasting activities undertaken during the bulk sampling process should continue during the construction phase. <u>*Decommissioning Phase*</u> • Downscaling and retrenchment should be properly communicated to all temporary and permanent staff. • Training programmes should be adjusted to allow for training of non-mining related skills. • CSR projects should be focused on other sectors rather than mining. • A Closure Plan should be compiled where the social risks associated with mine closure are outlined together with appropriate actions plans to relieve communities and individuals from the impacts associated with mine closure.
Responsibility	The construction and/or mine manager.
Timeframes	As per construction, operational, and decommissioning phases outlined above

2.14 Health

	Management
Phase	Construction and Operational.
Potential impact(s)	• Potential changes in social cohesion related to influx of people. • Safety and security. • Health impacts related to inadequate housing. • Lifestyle and associated health impacts such as STI's.
Objectives/targets	<u>Construction and Operational Phase</u> • Improve social cohesion in community. • Improve financial skills in employees and extended families and communities. • Reduce substance above and bad moral choices. • Improve aesthetics in area. • Improve road safety.

	• Increase awareness on safety. • Reduce injuries on and off site. • Reduce impacts of blasting in terms of vibrations. • Reduce the prevalence of TB • Reduce overcrowding • Improve vaccination coverage. • Reduce the prevalence of communicable diseases. • Improve capacity of health services • Prevent additional health impacts resulting from improper health services. • Prevent transmission, reduce prevalence and mitigate effects on STI's. • Increase awareness about lifestyle diseases. • Reduce adverse impacts of non-communicate diseases in workforce and potentially affected community. • Reduce environmental impacts such as spills, air pollution, water pollution etc. • Reduce burden on existing services.
Management measures	• Construction and Operational Phase • Conduct education programmes on violence-prevention, socio-economic education, financial skills, substance abuse and general environmental principles such as illegal dumping. • Maintain road infrastructure and enhance the visibility of truck and intersections. • Establishment of a Helpline where employees and surrounding communities can report aesthetic and health issues and give suggestions. • Create awareness, or conduct awareness training associated with overcrowding such as: fires, burns, and road safety. • Undertake awareness campaigns at schools with focus being on: traffic-safety, paraffin, pesticide, and domestic fuel use. • Provide adequate measures to curb dust suspension. • Training of employees on safety issues. • Collaborate with relevant departments on housing requirements. • Collaborate with the Department of Health on awareness creation around vaccinations to communicable diseases for vulnerable populations such as children. • Collaboration with clinics to identify opportunities for assisting with health services. • Establishment of no-site health facility operational at the onset of construction. • Create awareness and assistance for STI's • Provide educational handouts for use in local clinics. • Implement programmes to support the: psychosocial, emotional, and mental health of workforce.
Responsibility	The construction and/or mine manager.
Timeframes	As per construction, operational, and decommissioning phases outlined above

2.15 Compliance and Performance Assessment

Maseve needs to ensure that its operations are in compliance with this Environmental Management Plan (EMP), should this project be approved. This is to ensure compliance with NEMA, Act No. 107 0f 1998, section 28 that relates to the Duty of Care Principles. This section prescribes that an organisation must implement the necessary measures to mitigate of manage its activities which may cause significant pollution or degradation to the environment.

As part of good practice, the following is recommended:

- Due diligence investigations to determine environmental liabilities (in financial terms);
- Environmental management system implementation assessments; and
- Assessment of status in terms of environmental legislation and requirements.

For this purpose, a detailed environmental audit should be undertaken to assess compliance with the approved EMP and environmental legislation. It is recommended that this environmental performance assessment and legal compliance audit be undertaking every two years.

3. ENVIRONMENTAL MONITORING AND REPORTING

3.1 Soils, Land Capability and Land Use

Nutrient requirements reported herein are based on the monitoring and sampling of the soils at the time of the baseline survey. These values will definitely alter during the storage stage and will need to be re-evaluated before being used during rehabilitation. Ongoing evaluation of the nutrient status of growth medium will be needed throughout the life of the project and into the rehabilitation phase.

Soil fertility will be assessed and reported on an annual basis after closure. An annual environmental audit should be undertaken. If growth problems develop, ad hoc, sampling should be carried out to determine the problem.

Monitoring should always be carried out at the same time of the year and at least six weeks after the last application of fertilizer.

Table 2: Soil Fertility Monitoring Requirements

Monitoring Aspect/Activity	Timeframe	Reporting
Soil Fertility	Annually	Annually

Soils sampling should be analysed for the following parameters:

- pH (H2O);
- Phosphorus (Bray I);
- Electrical Conductivity;
- Calcium mg/kg;
- Caution exchange capacity;
- Sodium mg/kg;
- Magnesium mg/kg; Potassium mg/kg;
- Zinc mg/kg;
- Clay; and
- Organic matter content (C %).

The following maintenance is recommended:

- The area must be fenced, and all animals kept off the area until the vegetation is self-sustaining;
- Newly seeded/planted areas must be protected against compaction and erosion (Vetiver hedges etc.) – Refer to Appendix B Soil Impact Assessment;
- Traffic should be watered and weeded as required on a regular and managed and basis were possible and practical;
- Check for pests and diseases at least once every two weeks and treat if necessary;
- Replace unhealthy or dead plant material;
- Fertilise, hydro seeded and grassed areas soon after germination; and
- Repair any damage caused by erosion.

3.2 Flora

Due to the absence of quantitative data and related vegetation population dynamics (density, structure, age), this information will have to be collected prior to the construction of the mine and should actively commence, during the optimal flowering period (December – March). This will provide the baseline information against which rehabilitation and re-vegetation procedure can be measured. Crucial information to be documented and monitored with regards to vegetation is:

Vegetation cover – effective and sufficient vegetation cover reduce runoff and decreases erosion risk. Erosion leads to environmental degradation on a regional scale, due to loss of topsoil and increased sediment loads within drainage lines.

a. Basal cover: the distance from a set of randomly selected points to the nearest herbaceous plants (forbs or grass).
b. Tree cover: all woody species along a 100 m long by 2 m wide transect are recorded within the major vegetation units present in the area. The height of each individual is recorded. This method allows for the determination of the structure and age of woody species present in the area. It will indicate whether certain species are increasing or decreasing due to over utilisation (grazing pressure) or exploitation (wood harvesting).

Vegetation composition – the nature of the species present within a plant community changes due to various factors ranging from management to climate change. On a local scale the main driver for vegetation composition change is management or lack thereof which results in either overgrazing for exploitation or the transformation of area with an increase in edge effects and an increase in pioneer and invasive species. Therefore, the decrease or increase in species within the area will have to be monitored using the Braun-Blanquet approach and steppoint methods. The current study's Braun-Blanquet approach results can be used, but will have to be supplemented to facilitate monitoring at a larger/ finer scale. In addition, steppoints counts will have to be done prior to construction to provide a baseline with regards to the ecological status (veldt condition and carrying capacity) of the vegetation. These results will also reveal whether livestock, domestic or game, has changed their grazing patterns due to the mining activity, for example concentrating/ overgrazing natural vegetation further away from the mining activities than what is currently the case.

The same approaches and datasets will be used and generated for the tailings dams. In order to evaluate the success of establishing regionally indigenous species on the tailings dams to offset the local loss in vegetation diversity (due to established mining infrastructure).

Table 3: Vegetation monitoring requirements

Monitoring Aspect	Frequency of Monitoring	Reporting
Biodiversity	Every 2 years	Every 2 years
Tailings Rehab	Every 2 years	Every 2 years

3.3 Fauna

To be able to compare the faunal communities over time, the methods used for monitoring changes over time should be standardized as to limit the observer's error as well as to eliminate other potential sources of variation such as sampling effort (timing, location of sampling points etc.). It is therefore essential to have fixed sample points, sample periods and sample effort that are repeatable throughout the monitoring period. The following methods are proposed for monitoring changes in the faunal communities of the study area (both mining infrastructure and tailings rehabilitation area):

1. Mammals: small communities will be monitored using small mammal live traps for fixed sample periods biennially (2 years).
2. Motion-sensor camera traps baited with specific bait combinations will be used to sample for large mammals- especially carnivores and omnivores.
3. Birds: fixed point sampling as well as general sampling will be used to assess potential changes in bird communities in the study area.
4. Reptiles and amphibians: fixed point pitfall frapping and acoustic sampling (male frogs calling) as well as general sampling will be used to assess the study area's reptiles and amphibian communities.
5. Invertebrates: fixed point sweep samples of the vegetation of the study area will be used to assess potential changes of the invertebrate communities found in these microhabitats (these inverts will be used as indicator assemblages of the general invertebrate community of the study area). Additionally, fixed point butterfly monitoring will be used as a further indication of invertebrate community stability.

Table 4: Faunal monitoring requirements

Monitoring Aspect	Frequency of Monitoring	Reporting
Biodiversity	Every 2 years	Every 2 years
Tailings Rehab	Every 2 years	Every 2 years

3.4 Surface Water

Figure 85 shows the locations of the proposed surface water quality monitoring points for optimal surface water management (also please refer to Appendix B: Baseline Surface Water Quality Report). The need for additional quality as well as volume sampling locations could arise during rainy seasons and upon the implementation of the integrated surface water management system as well as the SWMP on site.

Table 5 is a summary of all the potential elements that should be monitored within each sample.

Table 5: Elements to be monitored

No.	Elements
1	pH Value @ 25°C

No.	Elements
2	Conductivity in mS/m
3	Total Dissolved Solids
4	Total Acidity as CacO3 to pH 8.3
5	Calcium, Ca
6	Magnesium, Mg
7	Sodium, Na
8	Potassium, K
9	Sulphate, SO4
10	Chloride, Cl
11	Fluoride, F
12	Iron, Fe
13	Manganese, Mn
14	Aluminium, Al
15	Nitrate & Nitrite as N
16	Total Alkalinity as CaCO3

The main purpose of surface water quality monitoring is to keep track of clean and dirty water systems and to ensure that these systems are separated at all time. Verifying the quality of a water body (component) will assist in the maintaining and updating of a water system status (clean or dirty).

These monitoring procedures will assist in the upgrading of the W&SB as well as the regulation of normal operating conditions and SW conditions on site.

Quality monitoring should be conducted on a quarterly basis and a report should be complied for each sample run. Surface water quality monitoring should continue annually for the entire life of mine. Table 5 describes a cost estimate of a typical annual surface water monitoring program to be conducted by an independent consultant.

Regular maintenance on all SW infrastructure is also required in order to obtain optimal water management on site.

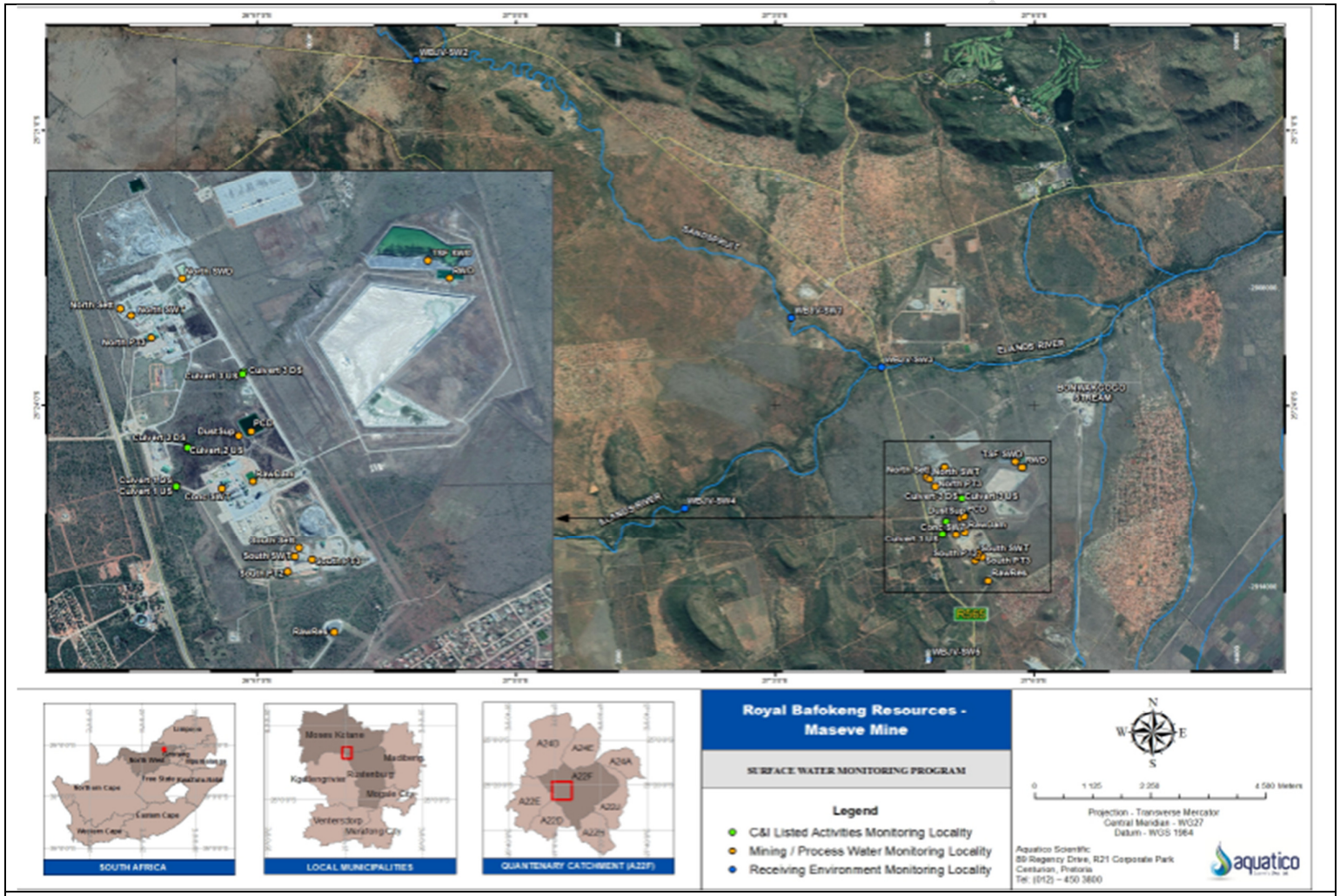

Figure 1: Proposed Surface Water Monitoring Points (Source: GCS, 2011)

3.5 Groundwater

The following groundwater monitoring localities must be monitored on a quarterly basis:

Table 6: Groundwater monitoring localities

Number on Map	Y coordinate LO27	X coordinate LO27	Monitoring Frequency	Analysis Spectrum
PTM-B1	-9898.000	2812195.000	Quarterly	pH, EC, TDS, Ca, Mg, Na, K, Total Alkalinity, Cl SO4, NO3, F, Al, Fe, Mn, Cr(total) Cr6+, NH4
PTM-B2	-9030.000	2811835.000		
PTM-B3	-9490.000	2810961.000		
PTM-B4	-8776.000	2812738.000		
E-S7	-6868.000	2809701.000		
EUB-4	-6920.030	2813619.885		
EUB-14	-7690.451	2813878.421		
EUB-23	-7521.789	2809683.118		
EUB-28	-4375.237	2812705.993		
EUB- 30	-9492.039	2813965.982		
EUB-24	-6266.699	2812448.627		

The figure below indicates the localities of the ground water monitoring boreholes.

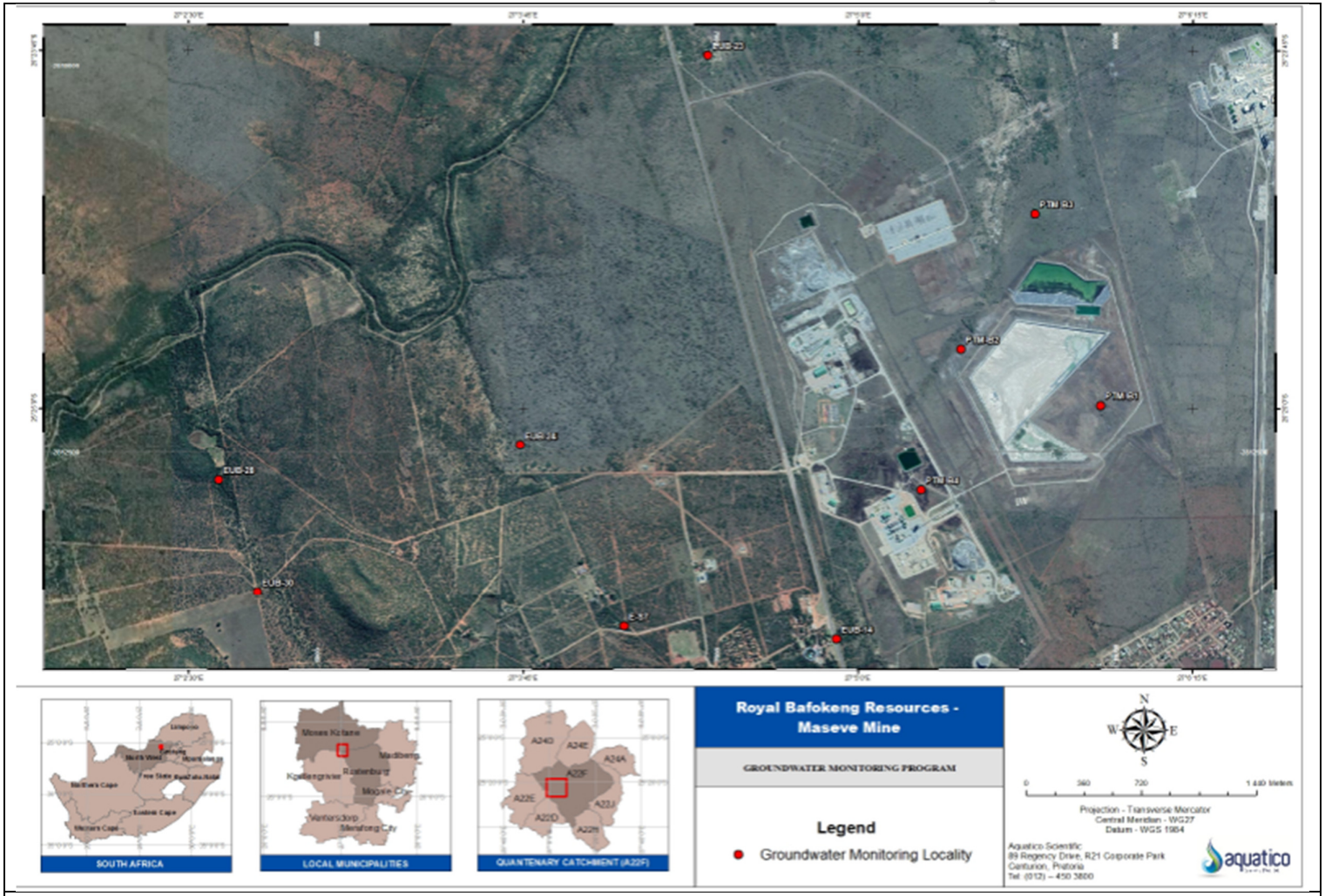

Figure 2: Proposed Groundwater Monitoring Points

3.6 Air Quality

Ambient air quality monitoring can serve to meet various objectives such as:

- Compliance monitoring;
- Validation of dispersion model result;
- Use as input for health risk assessment;
- Assist in source apportionment;
- Temporal trend analysis;
- Spatial trend analysis
- Source quantification; and,
- Tracking progress made by control measures.

Dust-fall Collection:

Based on the outcome of the impact assessment, it is recommended that a dust-fall collection network be established and that ambient PM_{10} monitoring be conducted. Details with respect to the monitoring recommendations are provided in subsequent sections.

It is proposed that a dust-fall collection network be established to determine dust-fall levels prior to the commencement of any construction activities. This will enable environmental managers to track the changes in dust-fall impacts as the project progresses.

Dust-fall monitoring should be conducted in accordance with the standard (as set out by American Society for Testing and Materials (ASTM) in ASTM D1739). A dust-fall monitoring network, comprising of 6 dust buckets, is proposed.

Locations were selected as follow:

- MD1 – Representative of dust-fall rates at the Sundown Ranch and downwind of the southern portal;
- MD2 – Representative of dust-fall rates at Frichgewaagd;
- MD3 – Representative of dust-fall rates at Chaneng;
- MD4 – Downwind of the northern portal;
- MD5 – Downwind of the concentrator plant; and
- MD6 – Downwind of the tailings dam.

The proposed monitoring locations are displayed in the figure below:

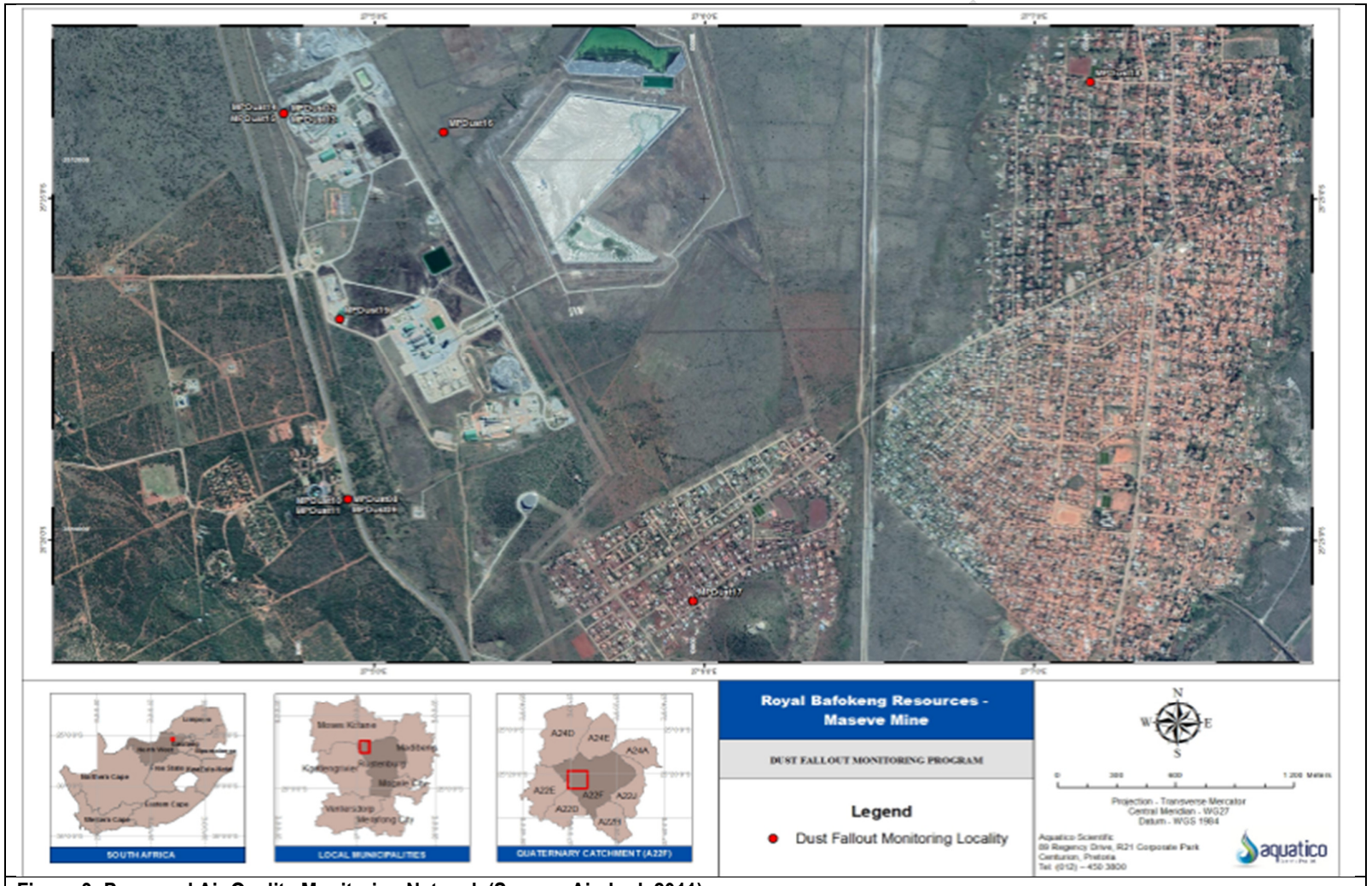

Figure 3: Proposed Air Quality Monitoring Network (Source: Airshed, 2011)

PM_{10} Monitoring:

PM_{10} monitoring can be economically carried out by the use of a "mini hi-vol" apparatus. This consists of a battery-driven flow-controlled sampling pump drawing ambient air through a filter for 24 h. the pre-and post-exposure weighting of the filters provides daily average concentration values. The changing of batteries and filters can be carried out by site personnel with minimum training, whilst the deployment at regular intervals (every 3 days or so, including weekends) provides a time series free of systematic sampling error, as well as long- term average value. The filters can be sent to a suitable industrial hygiene laboratory by courier for weighing and metal analysis. PM_{10} samples collected can be sent for chemical and metal analysis.

More sophisticated PM_{10} monitoring equipment that is less labour intensive but costlier could also be considered. If required, Airshed can provide recommendations with regards to procurement of PM_{10} monitoring equipment and supplies in South Africa.

Dust fallout will be monitored monthly and reported quarterly to the DMR. PM10 will be monitored at Sundown Ranch (MD1) only when the dust fallout concentrations consistently exceed the legal limits.

3.7 Noise

Noise monitoring should be carried out regularly at specific positions in order to detect deviations from predicted noise levels and additionally to enable corrective measures to be taken where warranted. Noise monitoring should be conducted at the five (5) monitoring points established for baseline monitoring. This should be conducted at the start of construction and at quarterly intervals. For the operational phase monitoring should be conducted at least twice a year.

3.8 Blasting

Third party consultation and monitoring should be considered for all ground vibration and air blast monitoring work. Additionally, assistance may be sought when blasting is done close to the highways. This will bring about unbiased evaluation of levels and influence from an independent group. Monitoring could be done using permanent installed stations. Audit functions may also be conducted to assist the mine in maintaining a high level of performance (with regards to blast results and effects related to blasting operations).

Vibrations should be monitored (with respect to the infrastructures listed below) against the recommendation group vibrations limit for each structure.

Table 7: Recommended vibration limits for infrastructure

Structure Description	Ground Vibration Limit (mm/s)	Air Blast Limit (dBL)
National Roads/ Tar Roads:	150	N/A
Steel pipelines:	50	N/A
Electrical lines:	75	N/A
Railway:	150	N/A
Transformers:	25	N/A
Water wells:	50	N/A
General house of proper construction	USBM Criteria with limitations for 6mm/s for mud houses	Shall not exceed 134dB at point of concern but 120dB preferred

3.9 Socio-Economic Environment

The implementation of this management plan will be the responsibility of Maseve and all appointed contractors. Many of the management plans presented above can be included in the day to day operational policies to the developed by Maseve.

In order to ensure general compliance to the proposed mitigation measures and management plans as outlined above, it will be essential for Maseve to appoint an independent auditor/ contractor to measure compliance against this SIA. It is hereby recommended that compliance monitoring be conducted as illustrated by the table below.

Table 8: Recommended Compliance Monitoring for Each Phase

Project Phase	Activity	Timeframes	Reporting
Construction	Interviews and consultation with contractors, service providers, Maseve HR department, PTM (operating company), RLM, MKLM and tribal leaders.	Annually	Annually
Operations	Interviews and consultation with contractors, service providers, Maseve HR department, PTM (operating company), RLM, MKLM and tribal leaders.	Every five years	Every five years
Decommissioning and closure	Development of SIA for closure. Interviews and consultation with mine employee representatives, and stakeholders such as community leaders (tribal authorities and political leaders), youth organisations, RLM and MKLM, as well as BDM.	Five years prior to decommissioning and closure.	Five years prior to decommissioning and closure.

4. Appendix 1: Locality Map

5. Appendix 2: Details of environmental assessment practitioner

Name:	Ms. Lebohang Moiloa
Name of Company	Green Gold Group (Pty) Ltd
Contact Details	Tel: 012 000 2562 Mobile: 073 232 4312 Email: EIAs@greengoldgroup.co.za Postal Address: PO Box 65384, Erasmusrand, 0165
Qualifications:	1. MBA: General Management 2. MSc: Geography (Waste Management) 3. BSc Hons: Geography (Environmental Management) 4. BSc: Physics and Geography
Professional Affiliations	1. Professional Natural Scientist (Pr.Sci.Nat). Reg. No. **400146/08** 2. International Association for Impact Assessment (IAIAsa). Reg. No. **1624** 3. Institute of Waste Management Southern Africa. Reg No. **10113105**
Experience	Seventeen (17) years of experience in environmental management, covering the following: • Integrated waste management planning • Environmental impact assessment • Feasibility studies • Waste licensing • Water use licencing • Environmental due diligence for investment projects **Industries:** • Government • Mining • Construction • Finance • Engineering